FACT SHEET

Sonoma Valley Post-Fire Water Quality Monitoring

Sonoma Valley Fires

In October 2017, the Nuns fire burned 56,556 acres and destroyed 1,355 structures in Sonoma County, making it the 6th most destructive fire in California's history[1]. Over 25% of the land in Sonoma Valley burned, totaling 30,033 acres[2]. Surface waters within and downstream of areas affected by the fires include stressed waterbodies, endangered species habitat, and the source water for drinking water systems.

Figure 1. 12:56 AM October 9, 2017. Photo obtained from October 2017 North Bay Fire Images, Sonoma Ecology Center[2]

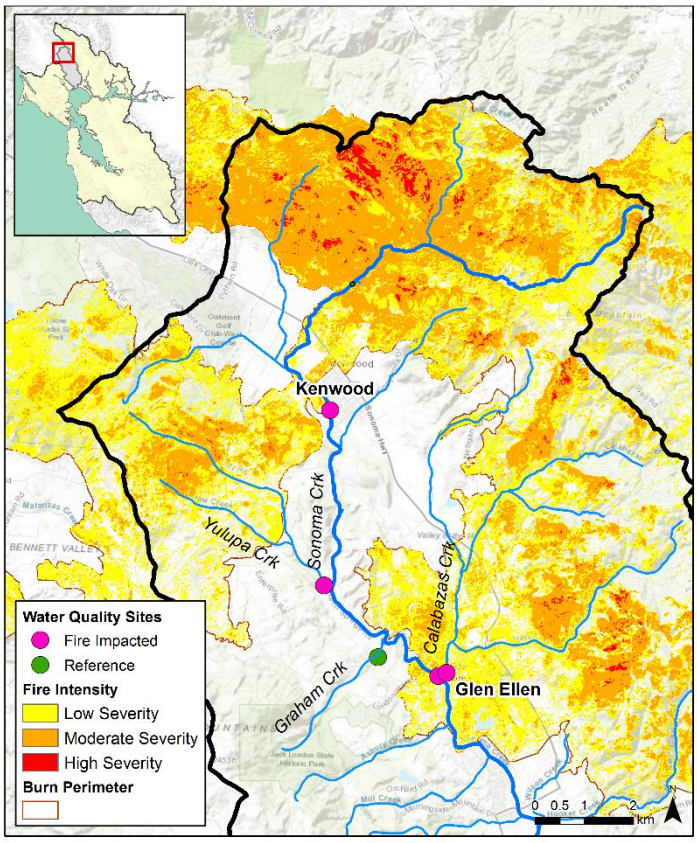

Figure 2. Post-fire water quality monitoring sites in the Sonoma Creek Watershed

Monitoring Plan

During storm events, surface waters may be affected as rain carries pollutants away from burn areas. The Water Board assessed potential impacts to the surface waters downstream of burned areas by monitoring chemical conditions during storm events. Research shows that fire affected areas in Southern California contained increased concentrations of contaminants including nutrients (e.g. nitrates and phosphorus), polycyclic aromatic hydrocarbons (PAHs), copper, zinc, mercury, lead, and other metals[3,4]. Several of these pollutants, especially metals, can be detrimental to human health and toxic to aquatic life. Many pollutants often attach to suspended particles and enter the water. Therefore, high flows can transport sediment bound pollutants to creeks and downstream to the San Francisco Bay.

Figure 3. A) Water Board and Sonoma Ecology Center Staff collecting baseline samples at Sonoma Creek. Photo by Melissa Roberts, Sonoma Ecology Center. B) Erosion and drainage controls installed next to burned structure near creek.

The Water Board collected samples from the locations in Fig. 2 on five occasions; pre-storm (baseline), during the beginning of the first storm of the season, and again during three subsequent "qualifying" storms. A qualifying storm was defined as predicted rainfall ≥1 inch in a 24-hour period. Precipitation and flow rates for each of the four storms are depicted in Fig. 4. More information on the San Francisco Bay Water Board's post-fire monitoring plan is available **here**.

Work Cited

1. Top 20 Most Destructive Fires, Cal Fire. http://www.fire.ca.gov/communications/downloads/fact_sheets/Top20_Destruction.pdf. Retrieved February 5, 2018.
2. Sonoma Valley Fire Recovery. https://www.sonomaecologycenter.org/fire-recovery/. Retrieved February 5, 2018.
3. Stein, E.D., J.S. Brown, T.S. Hogue, M.P. Burke, and A. Kinoshita. 2012. Stormwater contaminant loading following wildfires. *Environmental Toxicology and Chemistry* 31: 2625–2638. doi:10.1002/etc.1994.
4. Burke, M.P., T.S. Hogue, J. Barco, C. Wessel, A.Y. Kinoshita, and E.D. Stein. 2013. Dynamics of pre- and post-fire pollutant loads in an urban fringe watershed. *Environmental Monitoring and Assessment* 185:10131–10145.

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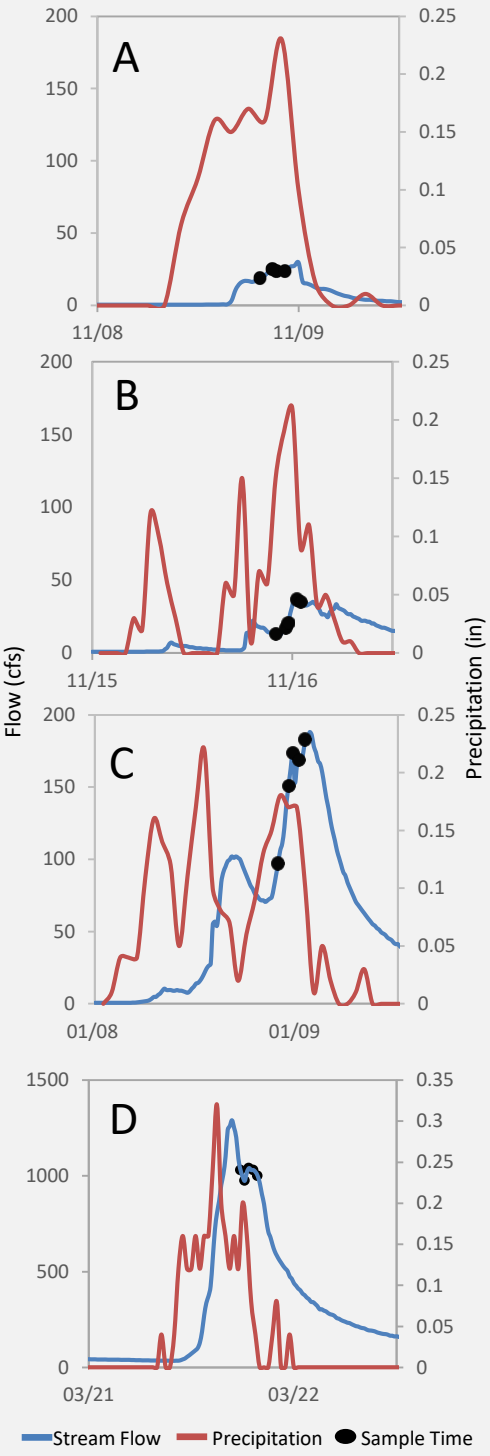


Figure 4. Precipitation, flow, and collection time for samples collected on A) Nov. 8-9, 2017 for a 1.25" storm; B) Nov. 15-16, 2017 for a 1.75" storm; C) Jan. 8-9, 2018 for a 2.65" storm; D) March 21-22 for a 2.22" storm. Flow data from Sonoma Creek at Kenwood, USGS Gage #11458433. Hourly precipitation data from California Irrigation Management System (CIMIS) Bennet Valley Station #158.

Data Evaluation

Evaluation guidelines for protection of aquatic life and human health were determined from SF Bay Regional water quality objectives, U.S. EPA criteria, or Regional Water Board environmental screening levels. Data for burned sites was compared to baseline data and a reference site in the watershed. The full data set is available **here**.

- Twenty of 969 samples exceeded chronic objectives for metals, oxygen, or pH. Four of these exceedances occurred at the unburned reference site.
- Increased pH at Kenwood during first storm could have been a fire signal. However, no other pH exceedances were observed in this study.
- Observed increases in metals and nutrients are likely a natural increase that occurs during storms and not related to the fire.
- The small increase in metals and nutrients between baseline and storm flows was similar for burned watersheds and the reference, unburned watershed.
- In contrast, metal concentrations from burned areas in Southern California were often hundreds of times higher than burned areas in this study (Figure 5).

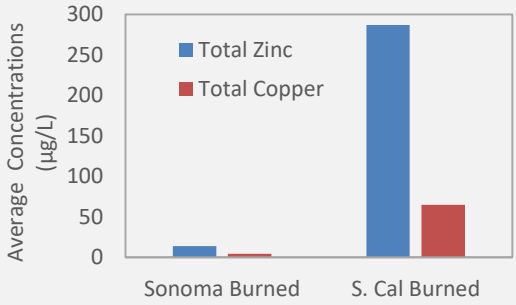
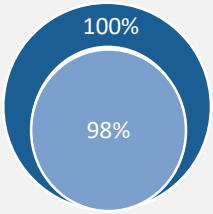


Figure 5. Comparison of metal concentrations in post-fire storm samples for Sonoma Creek and Southern California (Stein et al., 2012).

Conclusions

Results from this study indicate water quality was not impacted by the fires.

- The 2017-2018 winter was relatively dry. Storm magnitude and intensity may not have been high enough to mobilize all burned material.
- Slope stabilization, erosion and drainage controls, and other similar practices may have prevented burned material from entering the creeks.
  - Efforts were focused at properties in close proximity to creeks and other locations where pollutants would be readily carried to creeks via stormwater.
  - 82% of burned structures within 100 ft from the stream were assessed and stabilized by Cal Fire and Sonoma Ecology Center staff, with some funding provided by the Water Boards.



969 of 969 (100%) pollutant measurements were below acute toxicity objectives.

949 of 969 (98%) pollutant measurements were below chronic toxicity objectives.

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